Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

A REVIEW OF THE CERNAYSIAN MAMMALIA.

BY HENRY FAIRFIELD OSBORN.

This remarkably interesting mammalian fauna of the lower Eocene of France has been derived exclusively from a small exposure of the *Conglomerat de Cernay* near Rheims and described in numerous papers by Dr. Victor Lemoine, Professor in the École de Médecine de Reims. The collection is in the private museum of this author and his contributions are scattered through various French periodicals between 1878 and 1888. The Cernaysian fauna, it thus happens, is not thoroughly known or appreciated abroad except by those who have had the good fortune to examine the original types. The fossils are, for the most part, in beautiful preservation and the skulls of *Arctocyon*, *Pleuraspidotherium* and other forms are finer than anything known from European strata of corresponding age. The abundance of the Insectivora is especially notable, for these beds promise to throw as much light upon the early history of this order as the Puerco rocks do upon the Ungulata and Creodonta.

In course of two visits to Rheims I have collected the following brief studies and original sketches for publication, after a careful comparison of my own observations with those published by Dr. Lemoine. I wish to express my high appreciation of the value of the paleontological discoveries of this author and my personal indebtedness for the privilege of freely examining his collection.

Articles upon the Cernaysian Mammalia, Lemoine, 1878–88.

('78a.) "Communication sur les Ossements Fossiles des Terrains Tertiaires Inférieures des Environs de Reims." Soc. d'Histoire Naturelle de Reims, May 8th, 1878.

('78b.) "Recherches s. l. Ossem. Foss. d. Terr. Tert. Infér. d. Reims; 1re partie, Étude du genre *Arctocyon*." Ann. des Sc. Naturelles, July 1878, T. VIII.

('79a.) "Comm. s. l. Ossem. Foss. des Terr. Tert. Infér. d. Env. d. Reims;" Assoc. Franc. p. l'Avancement des Sciences, August, 1879. Reprinted, Rheims, 1880.

('80a.) "Terrains Tertiaires des Environs de Reims." Assoc. Franc. p. l. Avanc. d. Sc.; Reims, 1880.

('82a.) "Sur l'Encephale de *l'Arctocyon Duellii* et du *Pleuraspidotherium Aumonieri*." Bull. d. l. Soc. Géol. de France, 3e Série, t. x, April, 1882. See also Comptes Rendus, April, 1882.

('82b.) "Sur deux *Plagiaulax* tertiaires, recuellis a. Env. d. Reims." Comptes Rendus, Nov. 20th, 1882.

---

[1] The list of papers relating to the Reptilian and Avian fauna of Cernay is equally extensive.

('83a.) " Étude s. l. *Neoplagiaulax* d. l. Faune Eocène infér. d. Env. d. Reim." Bull. d. l. Soc. Géol. d. France, 3 Sér., T. XI, 1883.
('83b.) " Sur l'*Adapisorex*, nouv. gen. d. mamm. d. l. faune Cernays. d. Env. d. Reims." Comptes Rendus, Dec., 1883.
('84a.) " Caractères gén. d. *Pleuraspidotherium*, etc." Comptes Rendus, Dec., 1884.
('85a.) Étude s. quel. mamm. d. petite taille d. l. faun. Cern. d. Env. d. Reims." Bull. d. l. Soc. Géol. d. France, 3 Sér., T. XIII, Jan., 1885.
('87a.) " Sur le genre *Plesiadapis*, etc." Comptes Rendus, Jan., 1887.
('87b.) " Sur l'Ensemble d. recherches paléon. faites dans l' Terr. Tert. inf. d. Env. d. Reims." Comptes Rendus, Feb., 1887.
('88a.) " Sur quel. mamm. Carnassiers recuel. dans l' Eoc. inf. d. Env. d. Reims." Comptes Rendus, Feb., 1888.

PERIOD OF THE CERNAYSIAN.

Dr. Lemoine considers the Cernaysian parallel with the American Puerco and below the Wasatch level, as the fauna is evidently primitive and local beds are found above this horizon which contain *Hyracotherium* and other characteristic Wasatch genera. But *Coryphodon* is found in the *Conglomérat de Meudon*, which is generally considered by French geologists as contemporaneous with the Cernaysian. Upon the whole, the prevailing stages of development observed in the teeth of the different series are somewhat more modern than the Puerco types and offset the contemporary character given by *Arctocyon* and *Neoplagiaulax*.[1] The Cernaysian may, therefore, with some certainty be considered intermediate in time between the Puerco and Wasatch, and probably not far from parallel with the lower Egerkingen fauna recently described by Rütimeyer. I have arranged the following table, after consulting Professor Gaudry and the geological papers of Lemoine ('80a), de Lapparent (4, p. 1130) and Geikie (5, p. 844).

Divisions of the Suessonian or Lower Eocene of France, Paris Basin.

N. AMERICA.	GT. BRITAIN.	FRANCE.	
		C.	
	London Clay	Sables de Cuise	*Miolaphus.* *Hyracotherium.*
	Oldhaven Beds	B.	*Palaeonictis.*
Wasatch		Argiles a lignites	*Coryphodon.*
	Woolwich Beds	Conglomérat de Cernay, (de Meudon)	*Pleuraspidotherium.*
	(Plastic Clay.)	A.	
		Calcaires de Rilly la Montagne	*Protoadapis.*
Puerco	Thanet Sands	Sables de Bracheux; de la Fère	*Arctocyon primaevus.*
		Marnes de Meudon	

---

[1] Corresponding to *Mioclaenus* and *Ptilodus* respectively.

One marked feature of this fauna is that, while related to others of the lower Eocene, only one of the genera and none of the species have been found elsewhere. The order best represented is the Insectivora with at least four genera, then the Creodonta with three genera, the Mesodonta or Lemuroidea, and the Multituberculata. The last is a distinctively Mesozoic order and embraces in this horizon the single genus *Neoplagiaulax*, the survivor of an ancient and widely spread family. Leaving this exceptional type out of consideration, the following are the general characteristics of the Cernaysian mammals: 1. The teeth are tritubercular[1] and in only one genus (*Pleuraspidotherium*) is the *hypocone* of the superior molars fully developed; the intermediate tubercles (*para-* and *meta conules*) so characteristic of the Wasatch mammals, are not generally well developed. In the inferior molars, the primitive triangle is, in most species, broken by the loss of the *paraconid*. 2. The brain is small ('82a p. 333, *Arctocyon*, *Pleuraspidotherium*), with large olfactory lobes, narrow hemispheres leaving the optic lobes exposed and short transversely extended cerebellum. 3. The skull (excepting in the Lemuroidea) has a deep sagittal crest and broad, low occiput, with slender widely-arching zygomata, and the anterior nares small and terminal in position. 4. The feet are plantigrade (again possibly excepting the lemurs). One feature of great interest to which Dr. Lemoine called the writer's attention is the invariable presence of the astragalar foramen (see fig. 5, *af.*); this is observed also in all Puerco astragali. The femur has a third trochanter and the humerus usually has the entepicondylar foramen.

---

[1] The following is a table of the nomenclature which I have proposed for the tooth cusps equivalent to that employed by Gaudry in the "*Enchainements du Monde Animal*" p. 55. (See 1, p. 1072.) These terms express the homologies which exist between the upper and lower molar cusps, of all the known mammalia excepting those with multituberculate molars.

Abbr.	*Molaires supérieures.*		Abbr.
I,	denticule interne du premier lobe	protocone,	pr.
E,	" externe " " "	paracone,	pa.
e,	" " " second "	metacone,	me.
M,	" médian " premier "	protoconule,	pl.
m,	" " " second "	metaconule,	ml.
i,	" interne " " "	hypocone,	
	Molaires inférieures.		
E,	denticule externe du premier lobe	protoconid,	pr^{d}
	(denticule interne antérieure)	paraconid,	pa^{d}
I,	" " du premier "	metaconid,	me^{d}
c,	" externe du second "	hypoconid,	hy^{d}
i.	" interne " " "	entoconid,	en^{d}

With these primitive features in common, the orders are nevertheless sharply distinguished from each other, and the writer's principal grounds for considering this horizon as more recent than the Puerco, are the numerous instances of a high degree of reduction and specialization. The lemuroids are very abundant, with the long slender tail and rotating forearm of the climbers. *Plesiadapis* is an exact counterpart in molar development of the remarkably reduced *Anaptomorphus* of the Wasatch, while the older *Protoadapis* has the fuller dentition of the Puerco *Indrodon*. *Adapisorex* is not a related form as its name would indicate but should be classed with the tiny *Adapisoriculus* among the Insectivora. *Pleuraspidotherium* and *Orthaspidotherium* were also probably insectivores and as they are both represented by well preserved skulls and portions of the skeleton they constitute by far the best known of the early members of this important order. All the above animals belong to the smaller and least primitive members of this fauna. The more ancient facies is given by the small and large Creodonts. *Hyænodictis* is a small animal with molars similar to those of the Puerco *Triisodon*. *Tricuspiodon* has an inferior tuberculo-sectorial of the most primitive type. *Arctocyon* is the largest animal, with molars of the Puerco *Mioclænus* pattern. The minute *Neoplagiaulax* is in a slightly later stage of development than the Puerco *Ptilodus* of Cope. No Condylarthra have as yet been discovered in the Cernaysian ; the absence of ungulates is thus in marked contrast with their abundance in the Puerco and Egerkingen strata.

THE RHEIMS FAUNA.

Calcaires de Rilly	*Conglomérat de Cernay*	*Argiles á lignites.*
	(Lemuroidea.)	
Protoadapis	Protoadapis Copei.	
" crassicuspidens	Plesiadapis tricuspidens	Plesiadapis Daubréei.
" recticuspidens.	" Remensis	"
" curvicuspidens.	" Gervaisii	" Chevillioni.
	(Insectivora.)	(Ungulata.)
	Adapisorex Gaudryi	Pachynolophus.
	" Chevillioni	Protodichobune.
	Adapisoriculus minimus	Lophiodochoerus.
	Pleuraspidotherium Aumonieri	Lophiodon.
	Pleuraspidotherium Delessei.	
	Orthaspidotherium,	
	(Creodonta.)	
	Arctocyon Gervaisii.	
	" Dueilii.	

Hyænodictis Gaudryi	Hyænodictis Filholi.
Tricuspiodon.	
Procyonictis	Proviverra.
(Multituberculata.)	
Neoplagiaulax eocaenus.	
" Marshii.	
" Copei.	

MESODONTA.

Schlosser (2, p. 38) has shown that the American lower Eocene monkeys are probably not lemurs, as Marsh and Cope have supposed, because the true lemurs, with one or two exceptions, have incisiform lower canines and caniniform anterior premolars; in other words in most genera, the first premolar has the function and form of a canine. This important distinction renders it probable that *Protoadapis* and *Plesiadapis* belong among the Mesodonta (Pseudolemuroidea, Schlosser). The latter genus has a highly reduced and modified dentition, with no resemblance to that of *Adapis*. The former has a large canine and much reduced first premolar and resembles some of the American forms.

PROTOADAPIS, Lemoine.

P. (Plesiadapis) *recticuspidens*, Lem. '78, p. 14. *P.* (Ples.) *crassicuspidens*, Lem. '78, p. 13. *P. curvicuspidens*, Lem. '78, p. 12. *P. Copei*, Lem. '79a, p. 7.

Gen. char.: Dentition $i\frac{-}{2}\ c\frac{-}{1}\ p\frac{-}{3(4)}\ m\frac{-}{3}$. Inferior molars quinquetubercular. The first lower premolar occasionally present. The incisors small. The canines large.

This is an older and more primitive form than *Plesiadapis* as shown by its fuller dentition and the retention of the paraconid which completes the primitive triangle of the lower molars. These teeth recall the structure seen in *Microsyops* among the American Mesodonta. Although belonging to an older horizon we have no positive grounds for supposing that this genus is an ancestor of *Plesiadapis*, or that either of these forms are genetically related to *Adapis*. In fact the tendency to a rapid reduction of the premolars and specilization of the incisors point away from *Adapis* in both cases.

PLESIADAPIS, Gervais.

P. tricuspidens, Gervais (3 p.). *P. Remensis*, Lem. '87a. *P. Gervaisii*, Lem. '87a. *P. Daubréei*. Lem. '87a.

Gen. char.: Dentition $i\frac{2}{1}\ c\frac{1}{0}\ p\frac{2}{2}\ m\frac{3}{3}$. Median superior incisor and one lower incisor enlarged, remaining incisors and canines small or wanting. Upper molars tritubercular. Lower molars quadritubercular. Last lower molar with a third lobe.

Lower jaw. The large incisor of the type species is tricuspid but there is every shade of variation among the specimens to the unicuspid incisor found in *P. Daubreei.* Behind this tooth is a diastema. The premolars consist of a lofty cusp followed by a heel. The molars, except the last, are distinctly quadritubercuar with an occasional trace of the paraconid. Upper jaw. The enlarged incisor is followed by a small lateral incisor and canine. The last premolar has a slightly reduplicate external cusp. In the molars the transverse diameter exceeds the antero-posterior, and as in *Anaptomorphus* the series is decidedly arched, the conules or intermediate tubercles are faintly developed while the hypocone is still a cingule.

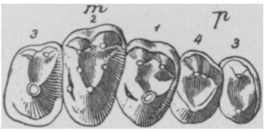

Fig. 1.

PLESIADAPIS(?) REMENSIS. Superior molar series, about $\frac{3}{2}$ natural size.

The skull is short and relatively broad, with a deep, rounded occipital crest. The chin is rounded; the posterior portion of the jaw is large and deep with a prominent coronoid process. The skeleton is decidedly lemuroid with a freely rotating radius, a third trochanter upon the femur, the tibia arched, the phalanges long and strong, the ungual phalanges flattened and oval at the tip.

INSECTIVORA.

Dr. Schlosser (2 p. 47) has pointed out that *Adapisorex* and *Adapisoriculus* are Insectivora both in their skeletal and dental characters, and has also referred them to a new family, the *Adapisoricidæ.* The humerus is perforated. The femur has a free head and elevated great trochanter.

ADAPISOREX, Lemoine.

A. Gaudryi, Lem. '83b, type species. *A. Chevillionei*, *A. Remensis*, *A. minimus*, Lem., '83b. See also '85, Plate X.

Gen. char.: Dentition i^{-}_{2} c^{-}_{1} p^{-}_{4} m^{-}_{3}. Lower molars quadritubercular. Third molar small and without posterior lobe. Lower incisors and canines procumbent.

The characters of the lower jaw of this small insectivore indicate clearly its wide separation from the above lemuroids. The jaw is long and slender, sloping to the chin with a weak and pointed coronoid and angle. The enamel upon the first incisor is banded; the second incisor is short while the canine is reduced. The premolars increase in size, pm_4 being very prominent. The lower molars diminish rapidly from m_1 to m_3, the latter being very small and lacking the third lobe which is so characteristic of the Mesodonta ; the pattern is mainly quadritubercular, the paraconid, if present, being very small.

ADAPISORICULUS, Lemoine.

The type of this genus (see '85, p. 212, Pl. XI) is much smaller than *Adapisorex* and well distinguished by the very lofty protoconid and metaconid of the lower molars. It has otherwise the same characters upon a small scale. The family relationship with *Adapisorex* is doubtful.

Decticadapis is another genus of small mammals founded upon two upper and one lower incisor teeth but not as yet well characterized.

Pleuraspidotherium and *Orthaspidotherium* have been considered in the Ungulate series by Lemoine but Schlosser is correct in placing them in the Insectivora, although I cannot agree with him in placing them near *Erinaceus*. While the molar patterns resemble somewhat those of *Erinaceus*, the complexity of the crowns of the posterior premolars removes the idea of relationship which is suggested by this resemblance. In *Centetes*, *Gymnura* and *Ericulus* we observe a similar assumption of the molar pattern by the premolars. In general, the reduction of the dental series between the median incisor and last premolar affords conclusive evidence as to the relationship of these forms to the Insectivora.

ORTHASPIDOTHERIUM, Lemoine.

Proposed '85a, p. 205.

Gen. char.: Dentition $i\frac{3}{3}$ $c\frac{1}{1}$ $p\frac{4}{4}$ $m\frac{3}{3}$. Upper molars as in *Pleuraspidotherium*. Third and fourth upper premolars with single external cusps. Inferior molars with less distinct crests, and m_3 with a third lobe. Fourth lower premolar simple with a posterior heel.

This genus is evidently related as a more generalized form to the following but is distinguished by its smaller size, simpler premolars, fuller dental series and relative absence of diastemata.

PLEURASPIDOTHERIUM, Lemoine.

P. Aumonieri, Lem. '78a, p. 15, type species. *P. Delessei*, Lem. 80a, p. 10.

Gen. char.: Dentition $i\frac{3}{3}$ $c\frac{1}{1}$ $p\frac{?\,3}{?\,3}$ $m\frac{3}{3}$. Upper molars mainly quadritubercular, with small intermediate cusps.

Lower molars quadritubercular with distinct transverse crests; third lower molar without third lobe. Third and fourth upper premolars with single internal and paired external cusps. Fourth lower premolar quadritubercular.

Upper jaw. The incisors decrease in size laterally, forming a series with the small canine, behind which is the rudimentary first premolar followed by a diastema. The third premolar is tritubercular; the fourth has in addition the trace of the protoconule and is thus evidently assuming the molar pattern. The outer faces of the para- and meta-cones are flattened with a median cingulum cusp, presenting a resemblance to the same aspect of the molars of *Pachynolophus;* only the second and third molars have developed the hypocone, and the crowns are still subtriangular. Lower jaw. The lower median incisor is small; the second incisor is large and nearly horizontal. The anterior triangle is still marked by the persistence of the paraconid.

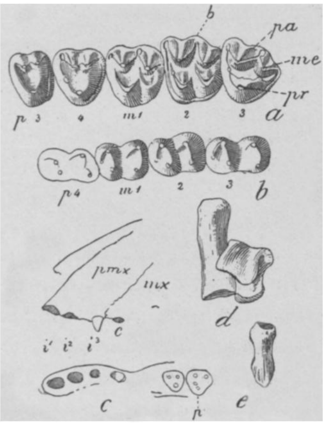

Fig. 2.

PLEURASPIDOTHERIUM (?) AUMONIERI. *a*, Superior molar series, omitting anterior premolar, x$\frac{1}{1}$. *b*, Inferior molars, omitting two anterior premolars, x$\frac{1}{1}$. *c*. Lateral and inferior views of the premaxillary region (reduced). *d*, Anterior view of the astragalus and calcaneum (reduced). *e*, Distal phalanx, association somewhat uncertain.

The skull has a strong arched sagittal crest with a broad low occiput and spreading sagittal crests. The mastoid is exposed. Dr. Lemoine describes two small bones between the frontals and nasals, also an inter-parietal. The anterior nares are small and terminal in position and the posterior nares are placed posteriorly. The proportions of the cranial and facial regions suggest those in *Didelphys.* Skeleton. The limbs are rather short. There are two sacral vertebræ (see '84b). The femur has a third trochanter and pit. The fibula is complete and the tibia articulates with the calcaneum ('84b). The astragalus has a flat trochlea and the usual foramen; the neck is long; it articulates distally with the navicular only. The calcaneum has the usual concave cuboidal facet.

The humerus has no condylar foramen. The structure of the radius indicates no power of rotation; the ulna has a well-developed olecranon process. Dr. Lemoine states that the metacarpals are shorter than the metatarsals. The phalanges spread very slightly and are cleft distally. The brain shows (see '82a) elongate olfactory lobes and hemispheres with extremely narrow frontal lobes. The cerebellum is short and extended transversely.

CREODONTA.

The following genera belong to three families. *Arctocyon* to the *Arctocyonidae*. *Hyaenodictis*, probably to the *Mesonychidae*. *Tricuspiodon* cannot at present be classed. Its nearest affinities are with *Stypolophus* or *Didymictis*.

ARCTOCYON, De Blainville.

A. primaevus, De Blainville. *A. Gervaisii*, Lem. '78a, p.7. *A. Dueilii* Lem. '78a, p. 8.

Gen. char.: Dentition $i\frac{3}{3}$ $c\frac{1}{1}$ $p\frac{}{4-3}$ $m\frac{3}{3}$. The superior molars tritubercular with a well developed hypocone. The inferior molars quadritubercular with the paraconid usually absent. The premolars simple.

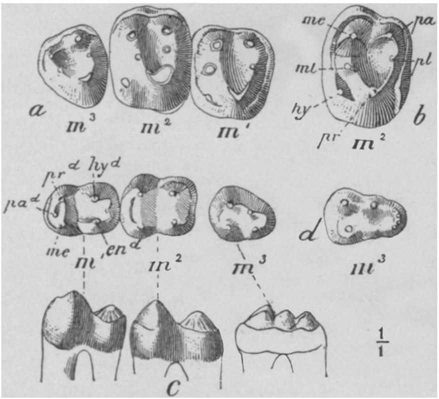

Fig. 4.

ARCTOCYON. *a*, Superior molars referred to *A. Dueilii*. *b*, *A. Gervaisii*, an unworn second superior molar. *c*, *A. Gervaisii*, inferior molar series viewed from the crown and external side, $\frac{1}{1}$. *d*, *A. Gervaisii*, last inferior molar. Abbrev.: *pr*, protocone; *pa*, paracone; *me*, metacone; *hy*, hypocone; *ml*, metaconule; *pl*, paraconule.

The general characters of this genus are too well known to require detailed enumeration here. The type species, *A. primaevus*, of de la Fère, is the oldest, largest and probably the most primitive; it has four premolars, the first premolar is one rooted. The *A. Dueilii* (type of *Heteroborus* Cope[1]), of the Cernaysian, also has four premolars; the first premolar is two rooted; the series is compact ('78, Pl. III, fig. 1) and the lower jaw is relatively short, deep and massive ('78a, p. 26). Dr. Lemoine estimates the posterior molar at c80 (antero-posterior diameter). The *A. Gervaisii* (type of *Hyodectes*, Cope[1]) is distinguished by three premolars, the elongate and relatively shallow lower jaw; the series is less compact; the posterior molar varies in antero-posterior diameter (see *c* and *d*, fig. 5).

---

[1] "Tertiary Vertebrata," p. 259.

The actual structure of the superior and inferior molars, as shown in the accompanying figures, is of great interest as the much worn molars of the type species have always been described as quadritubercular, and the published drawings of the Cernaysian specimens have given the impression that the crowns are covered with accessory cuspules. The effect of wear upon the crown is seen in a comparison of the second upper molars shown in *a* and *b*. The latter is a perfect example of the primitive tritubercular bunodont molar with the three secondary cusps, the proto- and meta-conules and hypocone in their initial stages of development. This type is seen in *Mioclaenus* and *Miolaphus* (*Platychoerops*), but is repeated in so many different phyla that, considered independently, it forms an insecure basis for taxonomic deductions. The lower molars are mainly quadritubercular; the anterior half of the crown, or primitive triangle, is, however, prominent and in the first molar the paraconid is quite distinct.

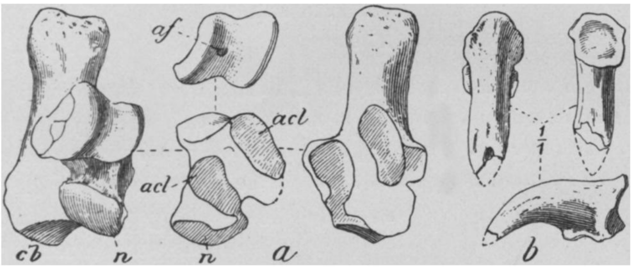

Fig. 5.
ARCTOCYON. *a*, Astragalus and calcaneum. Abbrev.: *cb*, calcaneo-cuboidal facet; *n*, astragalo-navicular facet; *af*, astragalar foramen; *acl*, *'acl*, superior and inferior astragalo-calcaneal facets.
b, Terminal phalanx, superior, inferior and lateral views.

HYAENODICTIS, Lemoine.

Proposed, '79, p. 5. *H. Gaudryi*, Lem. '85a, p. 204.

Gen. char.: Lower molars trenchant with two elevated cusps (protoconid and metaconid), and a prominent heel supporting a posterior pair of basal cusps (hypoconid and entoconid). Fourth premolar trenchant with one main cusp and two prominent basal cusps anterior and posterior.

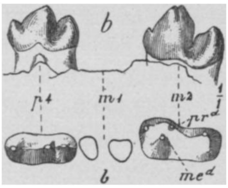

Fig. 3e.

b. HYAENODICTIS, internal and superior views of the fourth premolar and second molar, x$\frac{1}{1}$.

The molars of this genus differ from those of *Dissacus*, Cope, in the double posterior basal cusps and from those of *Triisodon*, Cope, in the less distinct separation of the internal cusps (? metaconid). They apparently agree with both the above types in the loss or reduction of the antero-internal cusp (paraconid) of the primitive triangle. There is a small cusp upon the anterior slope of the crown but this can hardly represent an element of the primitive triangle.

TRICUSPIODON, Lemoine.

Proposed '85, p. 204–5. See also '88a, p. 2.

This genus is apparently well established upon the type of a single lower molar, bearing a lofty primitive triangle with the three cusps complete. This portion resembles the tuberculo-sectorials of *Palaeonictis*, *Stypolophus*, *Didymictis*, or on a large scale the recent *Centetes* but the crown as a whole is well distinguished by the rudimentary character of the heel. This consists of a low simple cusp instead of the broad talon seen in the above genera. Dr. Lemoine has rightly recognized this tooth as closely related in form to the molars of the Jurassic *Peramus* and *Spalacotherium*.

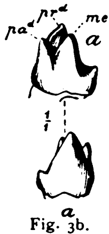

Fig. 3b.

a, TRICUSPIODON, probably a first inferior molar, x$\frac{1}{1}$.

Procyonictis (see '85a, p. 215) is founded upon a single tooth much less characteristic than the above. It is composed of a lofty main cone with anterior and posterior basal cusps. It is possibly a premolar of one of the above genera.

MULTITUBERCULATA.

NEOPLAGIAULAX, Lemoine.

N. (Plagiaulax) *eocaenus*, Lem. '80, p. 12; *N. Marshii*, '80, p. 12 (reprint). Genus established, '82b. *N. Copei*, '85, p. 213.

This well-established genus is distinguished from *Plagiaulax* and *Ptilodus* by the presence of but one premolar. Dr. Lemoine's collection embraces a number of isolated teeth, among them the upper molars. These (*c*) are composed of three rows of minute cones separated by well-worn longitudinal valleys. Each of these cones is subcrescentoid as in the upper molars of *Tritylodon.* The large upper premolar (*a*) has an indented border and is similar to that found in the maxilla of *Ctenacodon* (Marsh) with much more numerous serrations. It is difficult to form any positive opinion as to the position of the third tooth figured (*b*). It is approximately the same size as the above premolar, with one elevated row of seven marginal tubercles and one depressed row of five tubercles.

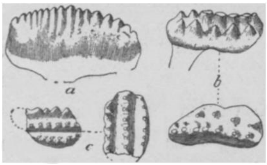

Fig. 6.

NEOPLAGIAULAX. *a*, Probably a superior premolar, referred to *N. Marshii.* *b*, *N. eocaenus*, Probably a superior premolar. *c*, A superior true molar, the posterior portion of the crown partly fractured. All figures enlarged approximately, $\frac{3}{1}$.

BIBLIOGRAPHY.

4. A. de Lapparent, *Traité de Géologie,* Paris, 1885.
5. Archibald Geikie, *Text Book of Geology,* London, 1882.
1. Henry F. Osborn, "Evolution of Mammalian Molars to and from the Trituberculár Type." American Naturalist, Dec., 1888, p. 1067.
2. Max Schlosser, "Die Affen, Lemuren, Cheiropteren, Insectivoren, Marsupialier und Carnivoren des Europäischen Tertiärs." Wien, 1887.